BE-06

IMPLICATION OF PROBLEM BASED INSTRUCTION (PBI) TOWARD STUDENT'S ABILITY IN SOLVING OF ENVIRONMENTAL POLLUTION PROBLEMS

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Abstract

The student's Ability to solve problems in daily life is considered low. Though the problem of environmental pollution due to organic waste requires problem solving ability to critically and creatively. In the world of education, problem-solving skills can be taught to students through the model of Problem Based Instruction (PBI). This research purposed to determine the implication of Problem Based Instruction (PBI) model toward student's ability in solving of environmental pollution problems. This research was a *Pre Experimental Design* using the *One Group Pretest-Posttest Design*. The research was done at SMA Negeri 1 Lamongan on January to July at class X with sample 7 regular classroom. Collected data of the student's ability to solve problems using pretest and posttest methods of assessment with average reliability of the instrument was 0.78, as well as observatory method to observe the feasibility of student activities. The result of test data were analyzed using the technique of Spearman rank correlation with α=5% followed by calculating the determination coefficient, while the observations data were analyzed by descriptive quantitatively. The results of research showed that students' ability to formulate the problem, determine the hypothesis and research variables was less than 20%, however there are positive implication and significant between implementation of PBI models for students' ability in solving environmental pollution problems by 98,01%, with value of R_S=0,99 (very high) and Z_H (12.69) > Z_{table} (0.96).

Key words: implication of PBI, the students ability to solve the problem of environmental pollution

INTRODUCTION

Problems often arise with increasing prosperity and people's life styles are related problems that can lead to sewage pollution (Hadisuwito, 2012). Waste to be one of the material covered in high school biology lessons that require students to not only know the definition and kinds of waste, but also makes the recycling of waste in an effort to resolve of environmental pollution problem.

Submission of material recycling of waste is often carried out by the method of lecture, question and answer, and the provision of independent tasks to make the recycling of waste products are carried unstructured. Likewise happens in SMA 1 Lamongan, teacher asks the students to make the recycling of waste products from a wide variety of inorganic waste. Though apart from

inorganic waste, there are also organic waste can also cause environmental pollution problems if not handled properly. Waste problem needs special attention because the impact on public health, so do not stop Lamongan regency invite the entire community to implement environmental hygiene even properly manage waste, primary organic waste from market activities and households residual (Sucipto, 2008). Students as part of a community component naturally capable of providing a wide range problem solve of waste issues, primarily organic waste for recycling in order to reduce environmental pollution, one of them by making a liquid organic fertilizer.

Recycling of waste materials can not only be taught using lecture method. As is well known that the problem of waste requires a real settlement which requires students to express a variety of alternative problem solving and authentic investigation. So in training students to express a variety of alternatives problem solving and authentic investigation can be taught through Problem Based Instruction (PBI) model in teaching and learning in the classroom. Basically, learning to use the model of PBI can train students to seek independent problem solving, understanding the student becomes higher, well-developed skills and knowledge gained significance (Nur, 2011).

Teaching in a particular class of material recycling of waste, should not only provide an informative knowledge to students, but also provide training to hone the skills of students in resolving a variety of issues of environmental pollution caused by waste, creating meaningful learning (Nur, 1998).

Based on the description of the background, it can be formulated problem, "How do the implications of Problem Based Instruction (PBI) toward student's ability in solve of environmental pollution problems?". The student's ability in solving the problems referred to in this research is the ability of the student in terms of determining the formulation of the problem, hypothesis, research variables, research steps, the arrangement of data, data analysis, and conclusions. This ability is trained by using the steps of the scientific method.

Hypothesis in this research can be formulated as follows: 1) H_0: there is no implication that a positive and significant between the implementation model of Problem Based Instruction (PBI) toward student's ability in solve of environmental pollution problems. 2) H_a: There is a positive and significant implications between the implementation model of Problem Based Instruction (PBI) toward student's ability in solve of environmental pollution problems.

The purpose of this research is , "Knowing the implications of Problem Based Instruction (PBI) toward student's ability in solve of environmental pollution problems". And the expected benefits of this research is "Making Problem Based Instruction (PBI) as a model of learning that can be taken into account to be used as an appropriate learning model to train students in solving authentic problems".

RESEARCH METHOD

This type of research is a pre experimental design using the one group pretest-posttest design. The research was conducted in January to July 2013, with research subjects were 162 students as sample of class X SMAN 1 Lamongan second semester of school year 2013.

The research was conducted through several steps, among others: 1) preparation phase, (a) determining the study sample and the learning device that adapted from Fatimah (2012), (b) compiling research instrument and instrument of validation; 2) implementation phase, at this stage, the researchers conducted the implementation of PBI models in class X SMAN 1 Lamongan in the learning process. Learning takes place over 3 times with implementing PBI syntax. Syntax PBI consists of 5 phases, among others, organizing students on issues, organize the students to learn, helping independent investigation or groups, develop and present the work and show it off, analyze and evaluate the problem-solving process.

The instrument used in this research are as follows: 1) assessment sheet, composed of pretest and posttest sheet that contains multiple choice questions with stuffing expanded with a

brief about why the answer selected by the student as one kind of authentic test (Rustaman, 2006). The score is adjusted to the assessment rubric sheet. The assessment instruments used, after the reliability test using Anates program, gained an average of pretest reliability value by 0,75, while the average posttest reliability value by 0,80; 2) observation of student activity sheet, is an instrument that contains statements column with "Yes" or "No" answers and column description.

The method of data collection in this research are: 1) method of test, consists of two types of tests, namely the pretest and posttest were used to assess the students' skills in solving environmental pollution problems before and after application of PBI models; 2) methods of observation, it is used to determine how and how much percentage of adherence to the activities at each meeting of students in the learning process.

The method of data analysis used in this research is a quantitative descriptive analysis, among others: 1) analysis of the assessment sheet. There are two kinds of assessment of pretest and posttest. Having obtained the value of pretest and posttest, then performed statistical analysis using Spearman Rank correlation technique followed by calculating the coefficient of determination. To test the significance of the rank correlation, then further testing can be done by using a rank correlation test. In this research, use α (standard error) 5% so that the critical value of ±1,96 (Z_{tables}). If the value $-Z_{1/2\gamma} \leq Z_H \leq Z_{1/2\gamma}$ then H_0 is accepted, whereas if $Z_H > +Z_{1/2\gamma}$ or $Z_H < -Z_{1/2\gamma}$ then H_0 is rejected (Saleh, 1996). The coefficient of determination is calculated by squaring the Spearman correlation coefficient was found, and then multiplied by 100 % (Sugiyono, 2013); 2) feasibility analysis of student activity over the whole meeting is a meeting from 1 to 3. Data about it is analysed quantitative descriptive analysis.

RESULTS AND DISCUSSION

Results

In this research, students are trained to solve the problem by carrying out the steps of the scientific method. Based on the summary of the results of observations of student activity feasibility in implementing the steps of the scientific method, the data obtained are presented in Table 1 below:

Table 1. Percentage of Feasibility Student's Activities Steps to Implement the Scientific Method

No.	Student's Activities	Feasibility (%)	Meeting
1.	Students formulate problems on worksheets 1	12,5	1
2.	Students determine hypotheses on worksheets 1	35	
3.	Students determine the variables of research on worksheets 1	15	
4.	Students preparing their experiments on worksheets 1	95	
5.	Students answer questions on worksheets 1	100	
6.	Students formulate problems on Worksheet 2	52,5	
7.	Students determine hypotheses on Worksheet 2	85	
8.	Students determine the variables of research on Worksheet 2	10	
9.	Students preparing their experiments on Worksheet 2	97,5	
10.	Students answer questions on Worksheet 2	100	
11.	Students observe and record the experimental results	100	2
12.	Students argued that the results obtained based on the observed data	100	3
13.	Students appropriately provide an analysis of the data obtained	100	
14.	Students conclude the experimental results exactly	100	

(Source: Sugiati, 2013)

Based on Table 1, it can be seen that each student activities in carrying out the steps of the scientific method implementation is spread out on meeting one, two, and three. The percentage of adherence to a row of student activity ranging from the lowest score namely the aspect of numbers 8, 1, 3, 2, 6, 7, 4, and 9 were carried out at the first meeting. While there are also aspects that have adherence percentage of students at 100% activity namely the aspect of numbers 5, 10, 11, 12, 13, and 14.

Next is the data obtained by the recapitulation and calculation using Spearman correlation rank test to the pretest and posttest values are presented in Table 2 below:

Table 2. The Results of Recapitulation and Rank Correlation (Spearman) Test

N	R_S	Z_{tabel} (α =5%)	Z_H	Conclution	Coefficient of determination (%)
162	0,99	1,96	12,69	$Z_H > Z_{tabel}$ (H_0 is rejected)	98,01

(Source: Sugiati, 2013)

Based on Table 2 above it can be seen that with a sample of 162 students, after counting recapitulation and obtained rank Spearman correlation coefficient of 0,99. Coefficient values are then used to test the significance of the rank correlation coefficient of determination as well. In significance testing, the value of Z_{count} of 12,69. Because this research used the standard error (α) of 5%, then the value of the Z_{table} is 1,96. That means $Z_{count} > Z\ t_{able}$, so H_0 is rejected and H_a accepted. And there is a strong implication of the application PBI models toward student's ability in solving of environmental pollution problems. It is indicated by the value of determination coefficient of 98,01%.

Discussion

During the learning process, conducted observation of student activity to determine the enforceability of the activities that should be undertaken by the students during the performance of the steps of the scientific method. Based on the data presented in Table 1, it can be seen that the students have a hard time doing step problem solving using the scientific method, among others, it is known that students difficulties in formulating the problem and determine the experimental variables evidenced by the low percentage of adherence to the activities of students who only account for less than 20%. This is because most of the students in each group could not find the most important issues of the readings contained in the article in Worksheet 1 and 2. The discovery of this problem requires the ability of the student in identifying the sentences that the subject or the core of the problem. Most of the groups that are fooled to the sentence as an introductory course, so many problem statements that are not appropriate. Besides the time of observation, there are several groups of students who formulate problem statements in the form of a sentence is not a sentence asked. In determining variables, students are not able to distinguish three kinds of variables correctly. Some students have been able to determine the variables, but the variable is less precise because it does not have a verb.

Similarly, when students carry out the activity of making a hypothesis, the percentage obtained enforceability of student activity by 35% (aspect number 2) and 85% (aspects No.7) were conducted at the first meeting. Students are able to make hypotheses but can not explain why formulate hypotheses as they specify. Students simply fabricated without any thought or reasoning using the theories that have been there and they know so far. In fact, to find a solution to the problem of activity needed to think deeply, because understanding is the foundation of problem-solving skills (Santyasa, 2004).

In general, students are less capable of transforming and managing the structures of knowledge in cognitive structure, it is considered closely related to intellectual ability or the ability

of the students' thinking (Erman, 2012). Results of research conducted by Erman and Sukarmin (2002) in Erman (2012) found that high school students in general are still capable of thought concrete. In fact, if the terms of age, they should be able to operate a formal thinking skills. As we know that the ability to set the variables in the experimental design, as well as the ability to distinguish the variables in an experiment or experiment belong to the category of formal thinking skills that F4 (Erman, 2012).

In addition to the lack of formal thinking skills, the difficulties experienced by students because students can not be trained in using the steps of the scientific method. Learning for which they get directly in the form of steps that have been presented from the teacher. This reflects that the learning paradigm in schools is still dominated by the learning behavioristik although constructivist learning paradigm has been known since 1710 (Haryanto, 2007).

The inability of students to solve problems can also be influenced by emotional factors. Getzels & Jackson in Nur (1998), states that students who can do well on a test of creative problem solving and skilled will decrease his fear to make mistakes than students who are not creative and unskilled. Creative and skilled nature may not necessarily be created in the absence of habituation and training as well as tuning in every opportunity.

However, based on the results of statistical analysis, followed by calculation of the coefficient of determination are presented in Table 2 above it can be seen that there is a positive and significant implications for the implementation of PBI models toward student's ability in solving of environmental pollution problems. This is indicated by the value of the Spearman correlation coefficient rank reached 0,99. That means, the correlation between the two is very high (Arikunto, 2012). As for knowing the significance of the effect, rank correlation test was done by comparing the value of the Z_{table} with the Z_{count}. It was found that the calculated value of Z_{count} (12,69) > Z_{table} (0,96) with a 5% error level. This shows that the correlation coefficient between the implementation of PBI toward student's ability in solving of environmental pollution problems by 0,99 is significant, meaning that the coefficients can be generalized (applied) in a population in which a sample of 162 students was taken.

Furthermore, based on Table 2 above, it can be seen that the coefficient of determination in this research totaled 98,01%. This value indicates that the implications of the implementation of PBI models toward student's ability in solving of environmental pollution problems amounted to 98,01%, and the remaining 1,99% is determined/influenced by other factors.

Application of PBI models provide positive implications for students primarily in terms of developing students' abilities and skills in solving of environmental pollution problems. The existence of this effect implies that there is an increase in the value of pretest with posttest values. This increase can be affected due to the different conditions before the current students after a learning process using PBI. Before using PBI's got learning, students are still not trained and accustomed to the process of scientific work. Meanwhile, after the implementation of PBI models, students have got the skill training to solve problems during the learning process takes place using a scientific method that is guided step by using Worksheet 1 and 2. So, by doing worksheets 1 and 2, students have had the experience and are trained to conduct experiments using the scientific method steps.

During the learning activities take place first at the first meeting while working on worksheets, in each class there are many questions that arise from the students. These include questions about how to formulate a problem, formulate a hypothesis, to distinguish various kinds of variables, as well as how to construct appropriate experimental steps. Students in each group feel confused to determine all these things. This suggests that continuous training is needed to improve the ability of students in learning activities using the scientific method. Because basically the scientific method as the basis of a person's very necessary to plan and take a series of steps in

solving a problem (Nur, 2000).

The application of learning models PBI is one of the students gained new experiences. With this model students are encouraged to be able to construct their prior knowledge becomes more complex, so then they would be able to solve the problem of other authentic. Learning to solve problems requires a lot of practice with a variety of different problems. This exercise will improve the thought process and how the students' knowledge construction in accordance with the level of development (Semiawan, 1988).

CONCLUSION AND SUGGESTION

Based on the analysis and discussion, it can be concluded that: "There is a positive and significant implications between PBI model implementation toward student's ability in solving of environmental pollution problems which includes the ability of students in determining the formulation of the problem, hypothesis, research variables, research steps, the composition of the data and analysis of data and conclusions of 98,01%, with the value of RS = 0,99 (very high), and Z_{count} value (12,69) > Z_{table} (0,96) with a standard error of 0,5%".

Based on the research that has been done, it can be suggested that: "To continue to train and hone the skills of students in solving real problems in everyday life, educators can use the PBI model of learning not only in the field of biology alone, but to all disciplines".

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